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(54) **REMOTE ACCESS TO A DATA STORAGE DEVICE**

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H04L 29/08	(2006.01)
G06F 21/60	(2013.01)

(52) **U.S. Cl.**

CPC ***H04L 67/1097*** (2013.01); ***G06F 21/60*** (2013.01)

(58) **Field of Classification Search**

CPC H04N 1/00957; H04N 1/0096; H04N 1/32358; H04N 21/4181; H04N 21/4184; H04N 21/4627; H04N 21/4753; H04N 21/8355; H04N 21/43615; H04N 21/4755; H04L 41/0803; H04L 41/0809; H04L 41/5064; H04L 61/2015; H04L 63/1408; H04L 67/306

USPC 726/4

See application file for complete search history.

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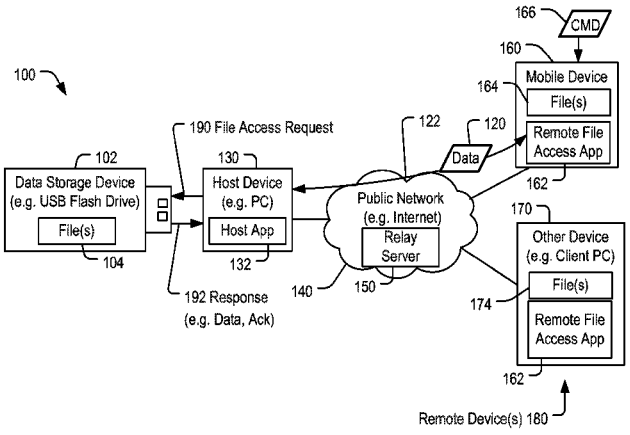
(57) **ABSTRACT**

A method may be performed in a data storage device while the data storage device is operatively coupled to a host device that is registered at a network server as a designated recipient of access requests directed to the data storage device. The data storage device includes a controller and a memory storing one or more files. The method includes receiving an access request originating from a second device that is distinct from the host device. The host device is accessible to the second device via the network server. The method also includes, when the second device is authorized to access the data storage device, sending a response with access information to the second device via the network server.

20 Claims, 4 Drawing Sheets



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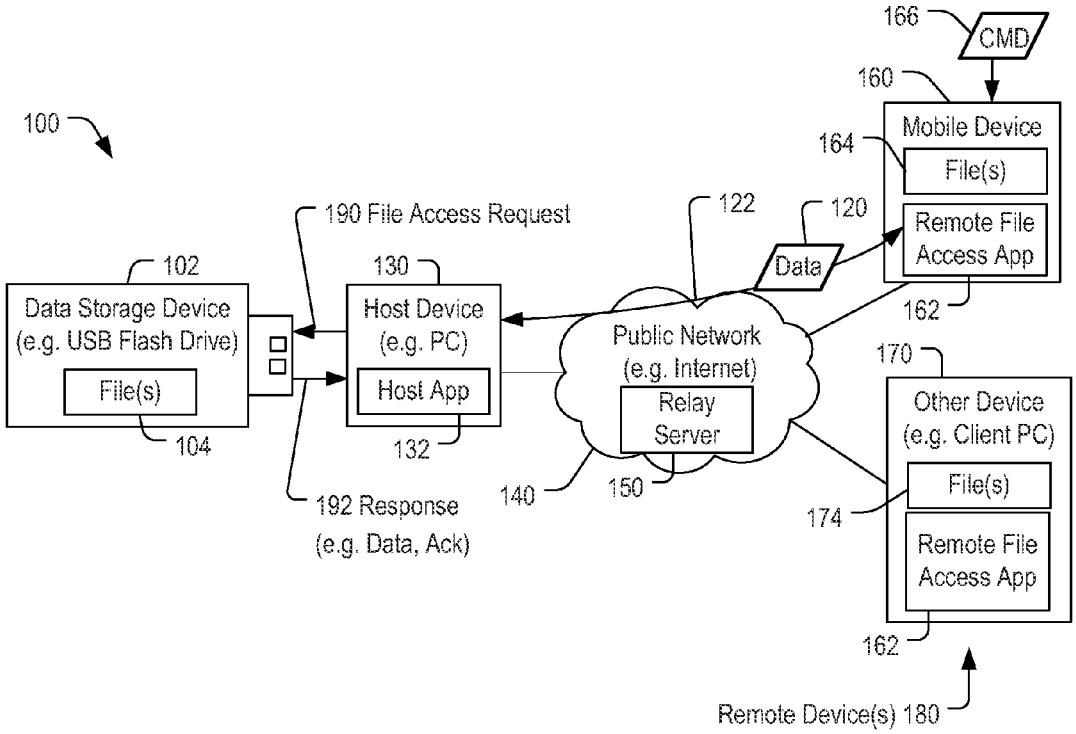
100
166
CMD
160
Mobile Device
164
File(s)
Remote File Access App
162
190 File Access Request
122
120
Data
102
Data Storage Device (e.g. USB Flash Drive)
File(s)
104
130
Host Device (e.g. PC)
Host App
132
Public Network (e.g. Internet)
Relay Server
140
150
170
Other Device (e.g. Client PC)
File(s)
174
Remote File Access App
162
192 Response (e.g. Data, Ack)
Remote Device(s) 180

FIG. 1

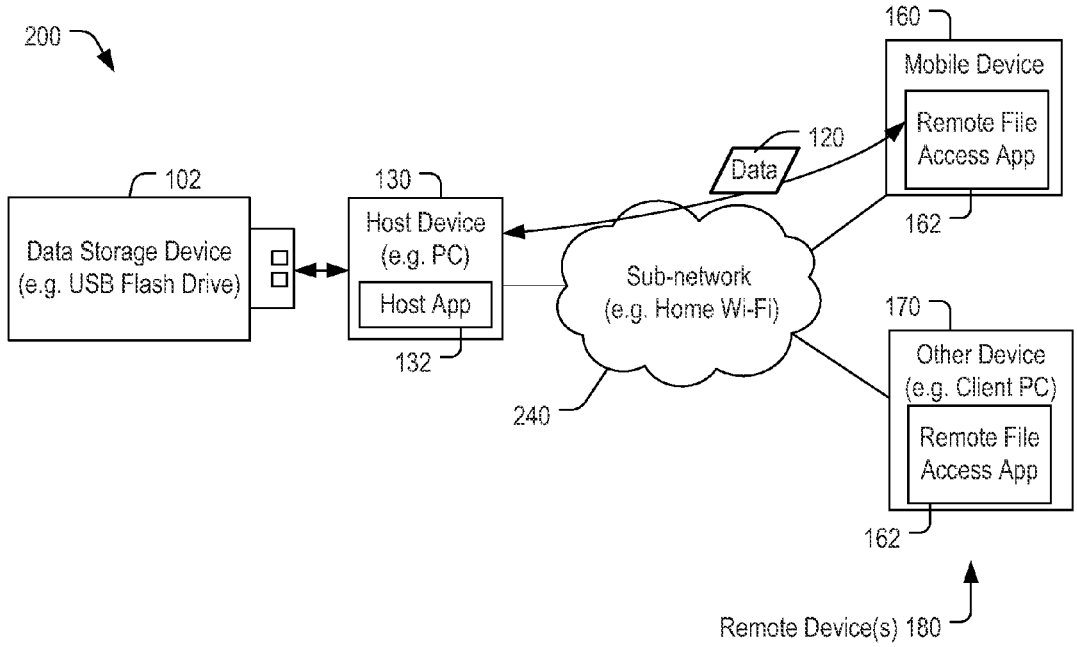
200
160
Mobile Device
Remote File Access App
162
120
Data
102
Data Storage Device (e.g. USB Flash Drive)
130
Host Device (e.g. PC)
Host App
132
Sub-network (e.g. Home Wi-Fi)
240
170
Other Device (e.g. Client PC)
Remote File Access App
162
Remote Device(s) 180

FIG. 2

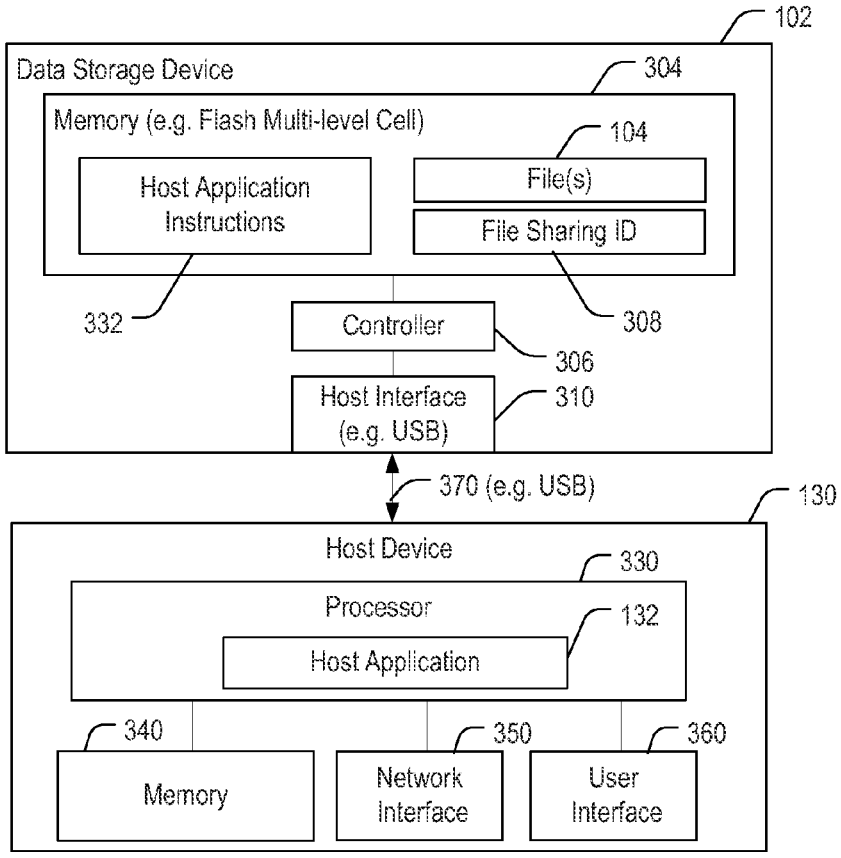
102
Data Storage Device
304
Memory (e.g. Flash Multi-level Cell)
104
Host Application Instructions
File(s)
File Sharing ID
332
308
Controller
306
Host Interface (e.g. USB)
310
370 (e.g. USB)
130
Host Device
330
Processor
132
Host Application
340
350
360
Memory
Network Interface
User Interface

FIG. 3

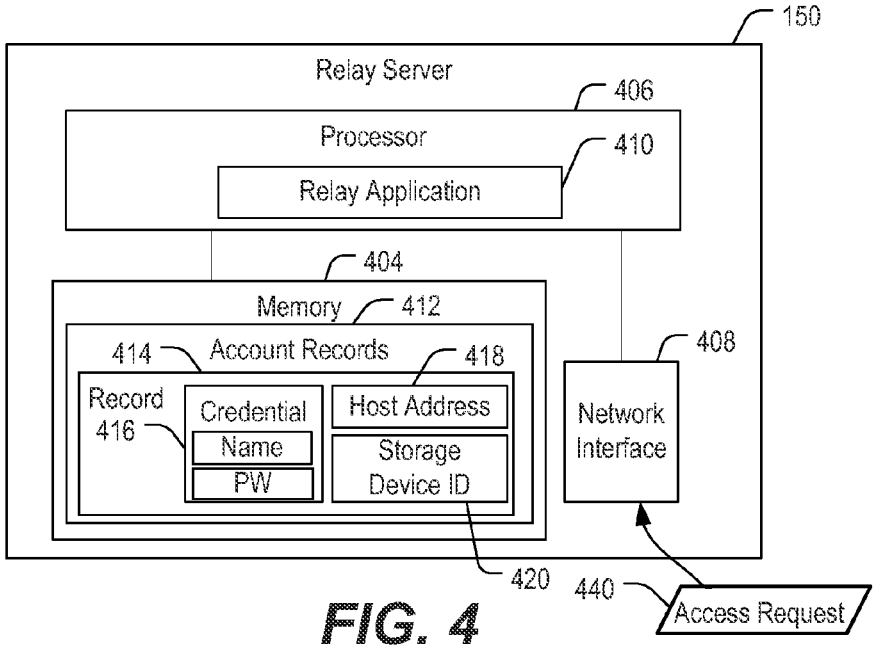
150
Relay Server
406
Processor
410
Relay Application
404
Memory
412
414
Account Records
418
Record 416
Credential
Name
PW
Host Address
Storage Device ID
408
Network Interface
420
440
Access Request

FIG. 4

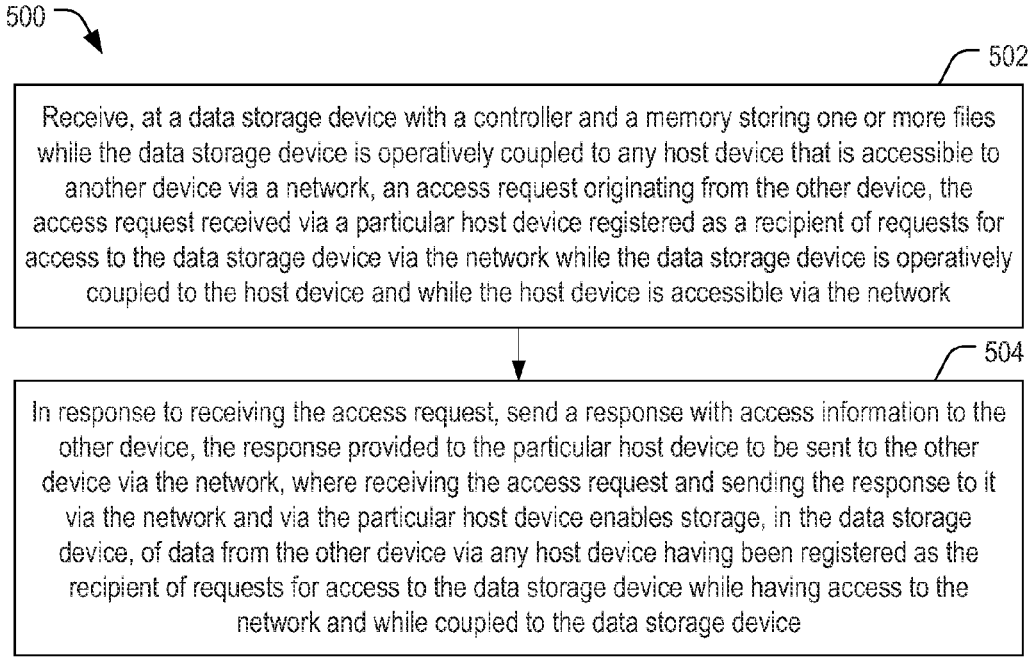
500
502
Receive, at a data storage device with a controller and a memory storing one or more files while the data storage device is operatively coupled to any host device that is accessible to another device via a network, an access request originating from the other device, the access request received via a particular host device registered as a recipient of requests for access to the data storage device via the network while the data storage device is operatively coupled to the host device and while the host device is accessible via the network
504
In response to receiving the access request, send a response with access information to the other device, the response provided to the particular host device to be sent to the other device via the network, where receiving the access request and sending the response to it via the network and via the particular host device enables storage, in the data storage device, of data from the other device via any host device having been registered as the recipient of requests for access to the data storage device while having access to the network and while coupled to the data storage device

FIG. 5

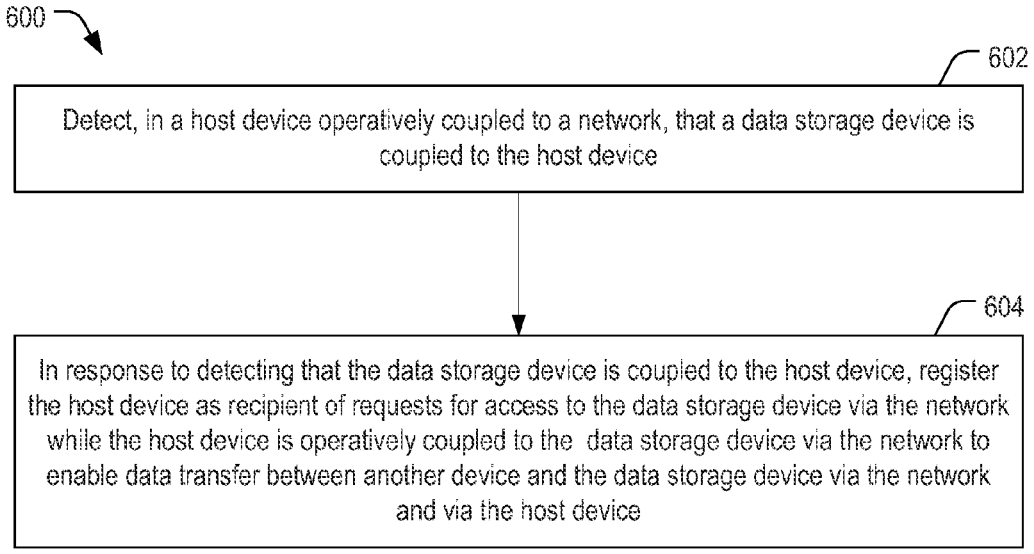
600
602
Detect, in a host device operatively coupled to a network, that a data storage device is coupled to the host device
604
In response to detecting that the data storage device is coupled to the host device, register the host device as recipient of requests for access to the data storage device via the network while the host device is operatively coupled to the data storage device via the network to enable data transfer between another device and the data storage device via the network and via the host device

FIG. 6

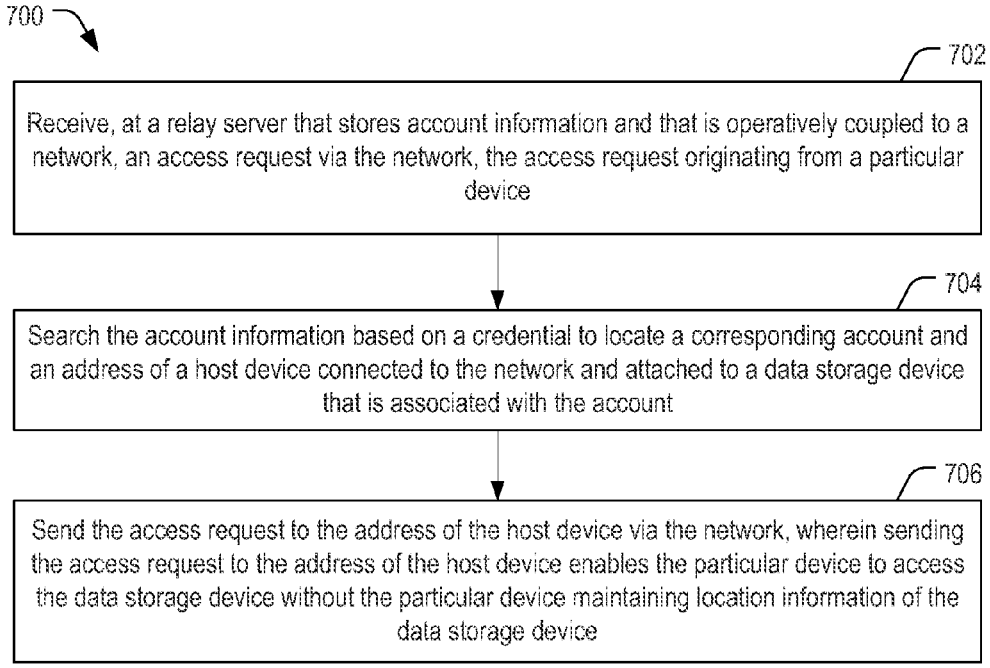
700
702
Receive, at a relay server that stores account information and that is operatively coupled to a network, an access request via the network, the access request originating from a particular device
704
Search the account information based on a credential to locate a corresponding account and an address of a host device connected to the network and attached to a data storage device that is associated with the account
706
Send the access request to the address of the host device via the network, wherein sending the access request to the address of the host device enables the particular device to access the data storage device without the particular device maintaining location information of the data storage device

FIG. 7

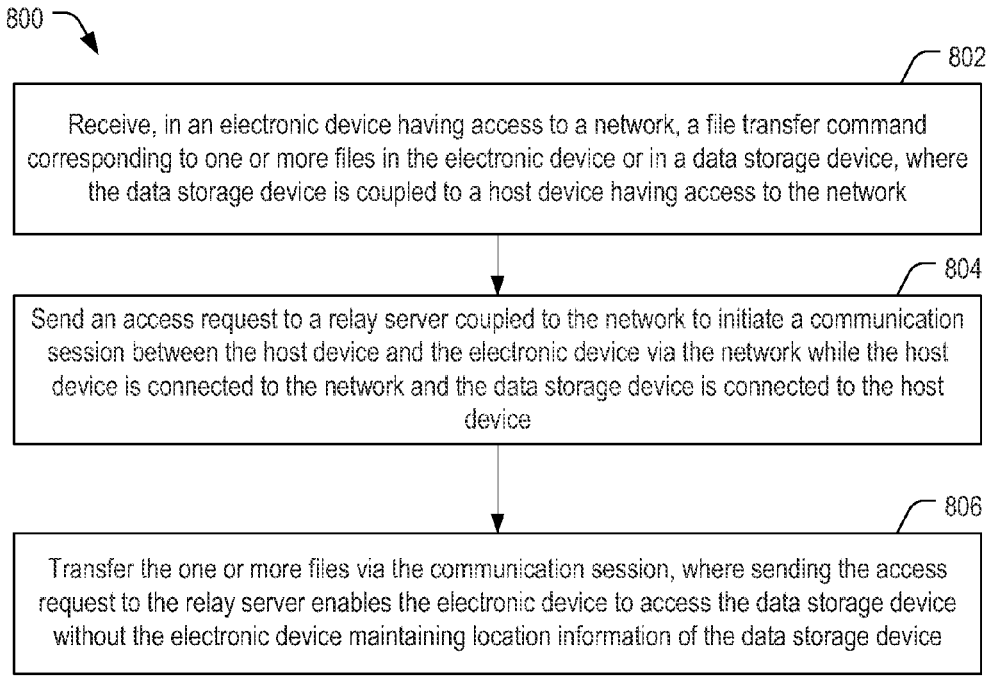
800
802
Receive, in an electronic device having access to a network, a file transfer command corresponding to one or more files in the electronic device or in a data storage device, where the data storage device is coupled to a host device having access to the network
804
Send an access request to a relay server coupled to the network to initiate a communication session between the host device and the electronic device via the network while the host device is connected to the network and the data storage device is connected to the host device
806
Transfer the one or more files via the communication session, where sending the access request to the relay server enables the electronic device to access the data storage device without the electronic device maintaining location information of the data storage device

FIG. 8

REMOTE ACCESS TO A DATA STORAGE DEVICE

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation of and claims priority to U.S. Non-Provisional patent application Ser. No. 13/335,571, filed Dec. 22, 2011, the contents of which are incorporated by reference herein in their entirety.

FIELD OF THE DISCLOSURE

The present disclosure is generally related to storing and retrieving data.

BACKGROUND

Non-volatile data storage devices, such as universal serial bus (USB) flash memory devices, removable storage cards, and solid state drives (SSD), have allowed for increased portability of data and software applications. In addition, portable devices such as mobile telephones commonly include still image, video, and audio recording capabilities but have limited memory for storage of media content. Such portable devices often lack common memory device connectors, such as USB connectors, causing inconvenience to users of the portable devices when attempting to acquire data from or transfer data to the devices.

SUMMARY

Systems and methods enable data transfer to and from a data storage device, such as a USB flash drive, that may be coupled to any host device having access to a network. A host device that has been coupled to the data storage device may register as a host of the data storage device, enabling a remote device also having access to the network, such as a mobile telephone or personal computer, to access the data storage device via the host device. Data transfer may be initiated at the host device to pull data from the remote device for storage at the data storage device or to push data that is retrieved from the data storage device to the remote device. Alternatively, or in addition, data transfer may be initiated at the remote device to pull data from the data storage device or to push data for storage at the data storage device.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a diagram of a first embodiment of a system to provide remote access to a data storage device;

FIG. **2** is diagram of a second embodiment of a system to provide remote access to a data storage device;

FIG. **3** is a diagram of a particular embodiment of the data storage device and host device of FIGS. **1-2**;

FIG. **4** is a diagram of a particular embodiment of the relay server of FIG. **1**;

FIG. **5** is a flow diagram that illustrates a particular embodiment of a method that may be performed by the data storage device of FIGS. **1-2**;

FIG. **6** is a flow diagram that illustrates a particular embodiment of a method that may be performed by the host device of FIGS. **1-2**;

FIG. **7** is a flow diagram that illustrates a particular embodiment of a method that may be performed by the relay server of FIG. **1**; and

FIG. **8** is a flow diagram that illustrates a particular embodiment of a method that may be performed by a device of FIGS. **1-2** that is remote from the data storage device.

DETAILED DESCRIPTION

Referring to FIG. **1**, a first embodiment of a system to enable access by a remote device to data at a storage device is depicted and generally designated **100**. The system **100** includes a data storage device **102** operatively coupled to a host device **130**. The host device **130** is communicatively coupled to one or more remote devices **180** via a public network **140**. For example, the host device **130** may be coupled to a mobile device **160** and/or another device **170** such as a client personal computer (PC). The host device **130** includes a host application **132**, and the remote devices **180** include a remote file access application **162**. The applications **132** and **162** enable the remote devices **180** to engage in transfer of data **120** to and from the data storage device **102** via the host device **130**.

The data storage device **102** may be a removable memory device, such as a universal serial bus (USB) flash drive. The data storage device **102** includes one or more files **104** that may be accessible to the host device **130** while the data storage device **102** is operatively coupled to the host device **130**. For example, the one or more files **104** may include media content such as audio data, video data, or image data, as illustrative examples.

The host device **130** may be configured to provide data to be stored at the data storage device **102** or to request data to be read from the data storage device **102**. The host device **130** may include a mobile telephone, a music or video player, a gaming console, an electronic book reader, a personal digital assistant (PDA), a computer, such as a laptop computer, a notebook computer, or a tablet, any other electronic device, or any combination thereof. The host device **130** may receive the host application **132** from the data storage device **102** upon coupling the host device **130** to the data storage device **102**, as described with respect to FIG. **3**. Alternatively, the host application **132** may be downloaded to the host device **130** from a remote server via the public network **140**.

The host device **130** may execute the host application **132** in response to detection of connection of the data storage device **102** to the host device **130**. For example, when the host device **130** detects that the data storage device **102** has been plugged in (e.g. at a USB receptacle of the host device **130**), the host device **130** may send a message to contact a relay server **150** via the public network **140**. The host application **132** may register the host device **130** as a current host for the data storage device **102**, and a record of such registration may be stored at the relay server **150** for assistance and location of the data storage device **102** by one or more of the remote devices **180**.

In addition, the host application **132** may be configured to cause the host device **130** to engage in the receipt and transfer of data between the data storage device **102** and one or more of the remote devices **180**. For example, the host application **132** may be configured to enable the host device **130** to receive requests from one or more of the remote devices **180** for data stored at the data storage device **102**, to retrieve the requested data from the data storage device **102**, and to send the requested data to the requesting remote device **180**. As another example, the host device **130** may be configured to be responsive to a user instruction to retrieve data from the data storage device **102** and to send the data to one or more of the remote devices **180**. As another example, the host device **130** may be configured to receive data from one or more of the

remote devices **180** and to store the data at the data storage device **102**. As yet another example, the host device **130** may be configured to receive via user input at the host device **130** an instruction to pull data from one or more of the remote devices **180** for storage at the data storage device **102**.

The mobile device **160** may be a device such as a mobile telephone, a music or video player, a portable gaming device, an electronic book reader, a personal digital assistant (PDA), a computer, such as a laptop computer, a notebook computer, or a tablet, any other portable electronic device, or any combination thereof. The mobile device **160** may store one or more files **164** at a local memory that has a smaller storage capacity than the data storage device **102**. The mobile device **160** may not have a connector that is compatible with a connector of the data storage device **102** (e.g. a USB connector) and therefore may not be capable of being directly connected to the data storage device **102**.

The mobile device **160** may implement the remote file access application **162**. The remote file access application **162** may be downloaded from a server, such as a mobile application server, to enable a user of the mobile device **160** to request to transfer (i.e., send, receive, or both) data or files between the mobile device **160** and the data storage device **102**. For example, a user of the mobile device **160** may enter user input (e.g. a command **166**) indicating a request to send one or more of the files **164** at the mobile device **160** to be stored to the data storage device **102**. The remote file access application **162** may contact the relay server **150** to obtain an address of a current host of the data storage device **102**, such as the host device **130**. The remote file access application **162** may receive an indication of an address of the host device **130** from the relay server **150** and may initiate a communication session **122** with the host application **132** of the host device **130**. The communication session **122** between the remote file access application **162** and the host application **132** may enable a user of the mobile device **160** to send data to be stored at the data storage device **102** and/or to retrieve data from the data storage device **102** to be stored locally at the mobile device **160** and may appear to a user as if the data storage device **102** were local to the mobile device **160**.

The other device **170** may also execute a version of the remote file access application **162** to enable a user of the other device **170** to remotely access data at the data storage device **102** (i.e. to send data and/or to receive data) via the host device **130**. For example, different versions of the remote file access application may be configured to function for a variety of device types and/or operating systems. The other device **170** may store one or more files **174** that may be transferred to the data storage device **102** by the remote file access application **162**, such as to provide a remote storage for backup purposes. The other device **170** may be a client PC device, such as a work computer of a user of the data storage device **102**.

The relay server **150** may be configured to store one or more records including account information corresponding to a user of the data storage device **102**. For example, the relay server **150** may be configured to receive a user credential from the host application **132** and to locate a user account associated with the received user credential, such as to register an address of the host device **130** as a current location of the data storage device **102**. In addition, the relay server **150** may be configured to receive communication from the remote file access application **162** including a user credential and to locate a user account associated with the user credential. For example, when the mobile device **160** sends a credential to the relay server **150**, the relay server **150** may search one or more user account records to locate a user account associated with the received credential. The relay server **150** may identify, via the located user account, that a requested data storage device **102** is coupled to the host device **130** and may provide a network address of the host device **130** to the remote file access application **162** at the mobile device **160**. The remote file access application **162**, having received the address of the host device **130**, may send a request via the network **140** to access data at the data storage device **102** via the host device **130**.

During operation, a user of the data storage device **102** may plug the data storage device **102** into the host device **130**. The host device **130**, upon detection of the data storage device **102** being coupled to the host device **130**, may cause the host application **132** to send information to the relay server **150** indicating that the data storage device **102** is coupled to the host device **130**. The relay server **150** may update information associated with an account of the user of the data storage device **102**.

The user may later launch the remote file access application **162** via the mobile device **160**, such as to retrieve a music file stored on the data storage device **102**. The mobile device **160** may initiate a communication session with the relay server **150**, such as via one or more wireless networks and/or one or more wireline networks, to contact the relay server **150** and to locate an address of a current host device of the data storage device **102**. The relay server **150** may receive a credential from the remote file access application **162**, locate corresponding information for the data storage device **102**, and provide to the remote file access application **162** information enabling the remote file access application **162** to communicate with the host device application **132** at the host device **130**. Having received information enabling contact with the host device **130**, the remote file access application **162** may establish the communication session **122** with the host application **132** of the host device **130**. To illustrate, the communication session may be unsecured or may include secured communication, such as by using transport layer security (TLS) or a secure sockets layer (SSL). During the communication session **122**, the remote file access application **162** may send one or more requests for retrieval of one or more files or other data from the data storage device **102**.

In response to receiving a request for data retrieval, the data to be retrieved from the data storage device **102**, the host application **132** may read the requested data from the data storage device **102** and may send the requested data **120** to the remote file access application **162** at the mobile device **160** via the public network **140**. To illustrate, the host device **130** may send a file access request **190** to the data storage device **102** and may receive a response **192** from the data storage device **102**. For example, the file access request **190** may be a request to store data to the data storage device **102** and the response **192** may be an acknowledgement (Ack) that the data is stored. As another example, the file access request **190** may be a request to retrieve data from the data storage device **102**, and the response **192** may include the requested data.

Although the system **100** illustrates the data storage device **102** coupled to the single host device **130**, the data storage device **102** may be removable and capable of being coupled to any of multiple host devices, each of which may run a version of the host application **132**. For example, when a user of the data storage device **102** unplugs the data storage device **102** from the host device **130**, the host device **130** may send a message to the relay server **150** indicating that the host device **130** is no longer a host of the data storage device **102**. When the user subsequently plugs the data storage device **102** into another host device (not shown), the other host device may initiate a registration with the relay server **150** to indicate that the other host device is the host of the data storage device **102**.

Subsequent inquiries from one or more of the remote devices **180** to locate a host of the data storage device **102** result in the relay server **150** identifying the other host device, rather than the host device **130**, as a host of the data storage device **102**.

As a result, a user of the data storage device **102** may couple the data storage device **102** into any host device that may be coupled to the public network **140** and may subsequently access data at the data storage device **102** via any remote device that also has access to the public network **140**. The data storage device **102** may therefore be used as an additional storage for remote devices, such as mobile devices or client PCs, and need not be tethered to a single host device but may instead be removed from one or more host devices and coupled to one or more other host devices according to convenience or a preference of the user. Using the data storage device **102** as an extended storage for the one or more remote devices **180** enables the remote devices **180** to access a larger amount stored data than can be stored at local memory and enables convenient transfer of content captured at the remote devices **180** to a personal storage device of a user.

Referring to FIG. **2**, a second particular embodiment of a system to enable file access to a data storage device by a remote device is depicted and generally designated **200**. The system **200** includes the data storage device **102** of FIG. **1** coupled to the host device **130** running the host application **132**. The host device **130** may be coupled to the one or more remote devices **180**, including the mobile device **160** and the other device **170**, via a sub-network **240**. For example, the sub-network **240** may be a home network compliant with an Institute of Electrical and Electronics Engineers (IEEE) 802.11 standard, such as a home WI-FI® (trademark of Wi-Fi Alliance, Austin, Tex.) network.

Coupling of one or more of the remote devices **180** to the host device **130** via the sub-network **240** enables data transfer to and from the data storage device **102** by the remote device. To illustrate, files such as video files and/or image files that may have been acquired at the mobile device **160** may be transferred to the data storage device **102** for backup and/or to free memory space of the mobile device **160**. As another example, content such as music, news, applications, or other content that may be stored at the data storage device **102** may be transferred via the sub-network **240** to be stored at the mobile device **160**.

The mobile device **160** may run the remote file access application **162** that is configured to communicate with the host application **132** when the mobile device **162** enters the sub-network **240**. To illustrate, in response to the mobile device **160** entering a WI-FI home sub-network **240** and acquiring a network address, the remote file access application **162** may send a query to contact the host device **130** via the WI-FI home sub-network **240** and may initiate data exchange. As a result, the system **200** may be used for automatic backup of data at the mobile device **160** when the mobile device **160** enters the sub-network **240**. As another example, the remote file access application **162** at the other device **170** may be configured to perform a data mirroring operation in response to another data storage device being connected to the other device **170**. To illustrate, when the data storage device **102** is coupled to the host device **130** and another data storage device is coupled to the other device **170**, an automated data synchronization process may be executed by the host device **130** and the other device **170** to transfer data between the data storage devices so that each data storage device stores a copy of data at the other data storage device. As a result, a backup copy of specified (or all) data at each data storage device may be maintained with relatively little user involvement. In addition, although data mirroring of multiple data storage devices is described within the context of the sub-network **240** in the system **200** of FIG. **2**, it should be understood that data mirroring functionality may also, or alternatively, be implemented via the public network **140** of the system **100** of FIG. **1**.

The system **100** of FIG. **1** and the system **200** of FIG. **2** each enable a use case where a user of a remote device **180** can push or pull data from the remote device **180** to the data storage device **102** or from the data storage device **102**, respectively. For example, a user of a remote device **180** may send a copy of data stored at the remote device **180** to be stored to the data storage device **102** (i.e. a "push"). In another example, a user of a remote device **180** may instruct the remote device **180** to retrieve data from the data storage device **102** to be stored at the remote device **180** (i.e. a "pull"). Similarly, a user of the host device **130** can cause the host device **130** to initiate a pull of data from one or more remote devices **180** to be stored to the data storage device **102**. Similarly, the user of the host device **130** may cause the host device **130** to push data retrieved from the data storage device **102** to one or more of the remote devices **180**. Also, the systems of FIG. **1** and FIG. **2** each enable backup use cases where a user may backup mobile device data to the data storage device **102** according to one or more rules, such as during a designated time period or in response to the remote device **180** being connected to a home network, such as the sub-network **240** of FIG. **2**.

Referring to FIG. **3**, a particular embodiment of the data storage device **102** of FIGS. **1-2** operatively coupled to the host device **130** is depicted. The data storage device **102** includes a controller **306** coupled to a memory **304** and to a host interface **310**, such as a USB interface/connector. The memory **304** includes the one or more files **104**, a host application **332**, and a file sharing identifier (ID) **308**. The host application **332** may be an executable set of instructions that may be executable at the host device **130** to run the host application **132** For example, the host application **132** may be a copy of the host application **332** or may be modified from the host application **332**, such as decompressed, reformatted, unencrypted, or otherwise modified.

The data storage device **102** may be a removable memory device, such as a USB flash drive or a memory card, such as a Secure Digital SD® card, a microSD® card, a miniSD™ card (trademarks of SD-3C LLC, Wilmington, Del.), a MultiMediaCard™ (MMC™) card (trademark of JEDEC Solid State Technology Association, Arlington, Va.), or a CompactFlash® (CF) card (trademark of SanDisk Corporation, Milpitas, Calif.). Alternatively, the data storage device **102** may be a solid state drive (SSD) or may be embedded memory in the host device **130**, such as eMMC® (trademark of JEDEC Solid State Technology Association, Arlington, Va.) memory and eSD memory, as illustrative examples.

The memory **304** may be a nonvolatile memory of a flash device, such as a NAND flash device, a NOR flash device, or any other type of flash device. The memory **304** includes multiple storage elements, such as memory cells of a multi-level cell (MLC) memory. The controller **306** may be configured to receive memory access requests from the host device **130** and to process data read from the memory **304**.

The host device **130** may be configured to provide data to be stored at the memory **304** or to request data to be read from the memory **304**. For example, the host device **130** may include a mobile telephone, a music or video player, a gaming console, an electronic book reader, a personal digital assistant

(PDA), a computer, such as a client PC, a laptop computer, a notebook computer, or a tablet, any other electronic device, or any combination thereof.

The host device **130** includes a processor **330**, a memory **340**, a network interface **350**, and a user interface **360**. The network interface **350** enables the host device **130** to communicate via one or more of the network **140** of FIG. **1**, the network **240** of FIG. **2**, one or more other networks, or any combination thereof. The user interface **360** may include a user input device, such as a touchscreen and/or keyboard, that enables the host device **130** to receive user input. The host device **130** may receive the host application file **332** from the data storage device **102**, such as via an autorun or autoplay function, and may execute the host application file **332** at the processor **330** to run the host application **132**. The host application **132** may be configured to identify the data storage device **102** as one of multiple data storage devices that may be associated with the host application **132** by querying and retrieving the file sharing ID **308** (e.g. a unique identifier) from the memory **304**.

During operation, the data storage device **102** may be operatively coupled to the host device **130**, such as via a universal serial bus (USB) **370**. Upon connection via the USB **370**, the host device **130** may automatically search for an autoplay or autorun application at the data storage device **102**. The autoplay or autorun application may cause the host application file **332** to be loaded to the host device **130**, installed (if not already installed at the host device **130**), and executed. In a particular embodiment, the data storage device **102** may have multiple versions of the host application file **332** for different host operating systems to provide compatibility for a variety of host devices. In another embodiment, the host application file **332** may be provided in a format that is platform-independent, such as an interpreted language or bytecode. The data storage device **102** may therefore be plugged into virtually any host device and may upload and provide connectivity software to enable the host device to register as a host of the data storage device **102** for remote file access by one or more of the remote devices **180** of FIG. **1** or FIG. **2**. Alternatively, the host application file **332** may instead provide an address or instructions to enable the host device **130** to download the host application **132** from a remote server, such as from the relay server **150** or another server. Similarly, the file sharing ID **308** may be accessed by the host application **132** and provided during registration with a relay server, such as the relay server **150** of FIG. **1**, so that the relay server may distinguish between a host of the data storage device **102** and a host of one or more other data storage devices associated with a same user account as the data storage device **102**. For example, a user may have multiple data storage devices that each have a different file sharing ID. Remote devices may locate a particular data storage device (e.g. as specified by a user) that is accessible via one or more host devices according the file sharing ID of the particular storage device.

Referring to FIG. **4**, a particular embodiment of the relay server **150** of FIG. **1** is depicted. The relay server **150** includes a memory **404** coupled to a processor **406**. A network interface **408** is coupled to the processor **406** and enables communication via one or more networks, such as the public network **140**.

The memory **404** includes one or more account records **412** that may be associated with one or more user accounts of file sharing applications. For example, one or more of the account records **412** may be associated with the data storage device **102** of FIG. **1**. The relay server **150** includes a relay application **410** that may be executed by the processor **406** to enable a remote device, such as one of the remote devices **180**, to engage in file transfer or data transfer with the data storage device **102** via the current host device **130** of the data storage device **102**. For example, the relay application **410** may be configured to receive a communication from the host device **130** indicating that the data storage device **102** has been coupled to the host device **130**. The indication may include a credential, such as a user name and password, that the relay application **410** may use to identify one or more corresponding account records **412**. The relay application **410** may update the corresponding account record **412** to indicate an address of the host device **130** as an address of the current host of the data storage device **102**.

The relay application **410** may also be configured to receive one or more communications from a remote device, such as an access request **440** from the mobile device **160** of FIG. **1**, including a credential such as a user name and password and also including an indicator of the data storage device **102** that is requested to be accessed by the remote device. The relay application **410** may locate the one or more account records **412** associated with the indicated credential and may locate an address of the host device corresponding to the identified data storage device, such as the address of the host device **130** of FIG. **1**. For example, the relay application **410** may be configured to locate a representative account record **414** that includes a credential **416** (that includes a username and a password), a storage device identifier **420**, such as the file sharing ID **308** of FIG. **3**, and an address **418** of a host device that most recently registered as the host of the data storage device having the identifier **420**.

The relay server **150** may be configured to respond to communication from a remote device by providing an address of the host device coupled to a requested data storage device. In this manner, the relay server **150** may enable a host device coupled to a data storage device to be registered as a network destination for data transfers to and from the data storage device and may provide the host information to any requesting authorized remote device for out-of-band data transfer between the remote device and the data storage device. Alternatively, or in addition, the relay application **410** may be configured to receive requests for data transfer from one or more remote devices and may forward the requests for data transfer to a host device of the requested data storage device. In this case, the relay server **150** does not provide an address of the host device to the requesting remote device, but may instead forward the request to the host device. The host device, in one embodiment, may open an out-of-band communication session with the remote device. In another embodiment, the host device may instead send responses to the relay server **150** to be forwarded to the requesting remote device.

Referring to FIG. **5**, a particular embodiment of a method **500** is illustrated that may be performed by a data storage device with a controller and a memory storing one or more files while the data storage device is operatively coupled to any host device that is accessible to another device via a network. For example, the method **500** may be performed by the data storage device **102** of FIGS. **1-3**. The network may be a public network, such as the public network **140** of FIG. **1**. As another example, the network may be a private network, such as the private network **240** of FIG. **2**.

An access request originating from the other device is received at the data storage device, at **502**. The access request is received via a particular host device registered as a recipient of requests for access to the data storage device via the network while the data storage device is operatively coupled to the host device and while the host device is accessible via the network. The other device may be a mobile device. For

example, the access request may be the file access request **190** of FIG. **1** that is received at the data storage device **102** from the mobile device **160** via the host device **130**.

The access request may be a forwarded request received via the host device **130** from the relay server **150** of FIG. **1**. The forwarded request from the relay server may include a credential from the other device to enable determination by the relay server that the other device is authorized to access the data storage device. For example, the credential may include a username and password that correspond to an account associated with a user of the data storage device. The access request and the response are communicated via a secured communication session, such as described with respect to the communication session **122** of FIG. **1**.

In response to receiving the access request, a response that includes access information is sent to the other device, at **504**. The response is provided by a data storage device to the particular host device to be sent to the other device via the network. For example, the response may be the response **192** that is provided by the data storage device **102** to the host device **130** to be sent to the mobile device **160**.

As an example, the access request may be a request to read a file from the memory and the access information may include data read from the file. As another example, the access request may be a request to write a file to the memory and the access information may include an acknowledgement that the file is written to the memory. To illustrate, the file may include media content originating at the other device (e.g. image data recorded by a camera of the other device).

Receiving the access request and sending the response to it via the network and via the particular host device enables storage, in the data storage device, of data from the other device via any host device having been registered as the recipient of requests for access to the data storage device while having access to the network and while coupled to the data storage device. As a result, the data storage device may be used as additional memory that is accessible to the other device via the network while the data storage device is coupled to a host device having access to the network.

Referring to FIG. **6**, a particular embodiment of a method **600** is illustrated that may be performed by a host device operatively coupled to a network. For example, the method **600** may be performed by the host device **130** of FIGS. **1-3**.

The method **600** includes detecting that a data storage device is coupled to the host device, at **602**. For example, the host device **130** of FIG. **1-3** may detect a physical interface connection to the data storage device **102**. To illustrate, the host device may detect a connection via USB plug detection in a USB receptacle of the host device.

In response to detecting that the data storage device is coupled to the host device, the method **600** includes registering the host device as recipient of requests for access to the data storage device via the network while the host device is operatively coupled to the data storage device to enable data transfer between another device and the data storage device via the network and via the host device, at **604**. Registering the host device may include sending a credential and an address of the host device to a relay server coupled to the network, such as to the relay server **150** of FIG. **1**.

Data transfer between the other device and the data storage device may include storing data from the other device to the data storage device. For example, the mobile device **160** of FIGS. **1-2** may send the data **120** to the host device **130** and the host device **130** may store the data at the data storage device **102**. Alternatively, or in addition, the data transfer may include sending data from the data storage device to the other device. For example, the data storage device **102** of FIGS. **1-2** may send the data **120** to the host device **130**, and the host device **130** may send the data **120** to the mobile device **160**.

The data transfer may be initiated via a user input at the host device. For example, a user of the host device **130** of FIGS. **1-3** may provide input via the user interface **360** of FIG. **3** indicating that data is to be transferred from the data storage device **102** to the mobile device **160** and/or from the mobile device **160** to the data storage device **102**. Alternatively, the data transfer may be initiated by the other device. For example, a user of the mobile device **160** of FIGS. **1-2** may provide input, such as the command **166**, via a user interface of the mobile device **160** indicating that data is to be transferred from the data storage device **102** to the mobile device **160** and/or from the mobile device **160** to the data storage device **102**.

Registering the host device as the host of the data storage device enables a user of a remote device, such as a user of the mobile device **160** of FIGS. **1-2**, to locate and access the data storage device for data storage and retrieval. The remote device can access a record of the registration of the host device, such as the record **414** of FIG. **4**, to locate the data storage device and therefore does not have to keep track of the data storage device as the data storage device moves from host device to host device. As a result, the data storage device may be used as additional memory that is conveniently accessible to the remote device via the network while the data storage device is coupled to a host device having access to the network.

Referring to FIG. **7**, a particular embodiment of a method **700** is illustrated that may be performed by a relay server that stores account information and that is operatively coupled to a network. For example, the method **700** may be performed by the relay server **150** of FIG. **1** and FIG. **4**.

The method **700** includes receiving, via the network, an access request originating from a particular device, at **702**. The access request includes a credential. For example, the access request may be the access request **440** of FIG. **4** and may include a username and password corresponding to a user of the mobile device **160** of FIGS. **1-2**.

The account information is searched based on the credential to locate a corresponding account and an address of a host device connected to the network and attached to a data storage device that is associated with the account, at **704**. The access request may be sent to the address of the host device via the network, at **706**. Sending the access request to the address of the host device enables the particular device to access the data storage device without the particular device maintaining location information of the data storage device.

File access information originating from the data storage device may be received via the network. The file access information may include the credential. For example, the data **120** read from the data storage device **102** of FIGS. **1-2** may be received at the relay server **150** and may include a username and password. The relay server **150** may search the account information (e.g. may search the account records **412**) based on the credential to locate the account and a destination address of the particular device, such as a destination address of the mobile device **160** of FIGS. **1-2**. The relay server **150** may send the file access information to the destination address of the particular device (e.g. the mobile device **160**) via the network.

By keeping track of which host device is a most recently registered host of the data storage device, the relay server enables a user of a remote device, such as the mobile device **160** of FIG. **102**, to locate and access the data storage device for data storage and retrieval. As a result, the data storage device may be used as additional memory that is accessible to

the remote device via the network while the data storage device is coupled to a host device having access to the network.

Referring to FIG. **8**, a particular embodiment of a method **800** is illustrated that may be performed by an electronic device having access to a network. For example, the method **800** may be performed by any of the remote devices **180** of FIGS. **1-2**.

A file transfer command corresponding to one or more files in the electronic device or in a data storage device, at **802** is received by the electronic device. The data storage device is coupled to a host device having access to a network. For example, the file transfer command may be the command **166** received at a user interface of the mobile device **160** of FIG. **1** to send files or data to, or to retrieve files or data from, the data storage device **102**.

An access request is sent to a relay server coupled to the network to initiate a communication session between the host device and the electronic device via the network while the host device is connected to the network and the data storage device is connected to the host device, at **804**. The access request may include a credential corresponding to an account associated with the data storage device. For example, the relay server **150** of FIG. **1** may receive the access request and may identify the record **414** associated with the credential **416** to identify the corresponding host address **418**. The address of the host device **130** may be received at the mobile device **160** via the network **140**, and the communication session **122** may be established using the address of the host device **130**.

The one or more files are transferred via the communication session, at **806**. Sending the access request to the relay server enables the electronic device to access the data storage device without the electronic device maintaining location information of the data storage device. A user of the electronic device may therefore use the data storage device as an extended data storage of a local memory of the electronic device.

Although various components depicted herein are illustrated as block components and described in general terms, such components may include one or more microprocessors, state machines, or other circuits configured to enable a data storage device, such as the data storage device **102** of FIG. **1**, to perform the particular functions attributed to such components, or any combination thereof. For example, the controller **306** of FIG. **3** may represent physical components, such as processors, state machines, logic circuits, or other structures.

The controller **306** may be implemented using a microprocessor or microcontroller programmed to be responsive to data read and write instructions from the host device **130**. In a particular embodiment, the controller **306** includes a processor executing instructions that are stored at the memory **304**. Alternatively, or in addition, executable instructions that are executed by the processor may be stored at a separate memory location that is not part of the memory **304**, such as at a read-only memory (ROM).

In a particular embodiment, the data storage device **102** may be a portable device configured to be selectively coupled to one or more external devices. For example, the data storage device **102** may be a removable device such as a universal serial bus (USB) flash drive, SSD or removable memory card. In a particular embodiment, the data storage device **102** includes a non-volatile memory, such as a Flash memory (e.g., NAND, NOR, Multi-Level Cell (MLC), Divided bit-line NOR (DINOR), AND, high capacitive coupling ratio (HiCR), asymmetrical contactless transistor (ACT), or other Flash memories), an erasable programmable read-only memory (EPROM), an electrically-erasable programmable read-only memory (EEPROM), a read-only memory (ROM), a one-time programmable memory (OTP), or any other type of memory.

The illustrations of the embodiments described herein are intended to provide a general understanding of the various embodiments. Other embodiments may be utilized and derived from the disclosure, such that structural and logical substitutions and changes may be made without departing from the scope of the disclosure. This disclosure is intended to cover any and all subsequent adaptations or variations of various embodiments.

The above-disclosed subject matter is to be considered illustrative, and not restrictive, and the appended claims are intended to cover all such modifications, enhancements, and other embodiments, which fall within the scope of the present disclosure. Thus, to the maximum extent allowed by law, the scope of the present invention is to be determined by the broadest permissible interpretation of the following claims and their equivalents, and shall not be restricted or limited by the foregoing detailed description.

What is claimed is:

1. A method comprising:

in a data storage device with a controller and a memory storing one or more files, performing, while the data storage device is operatively coupled to a host device that is registered at a network server as a designated recipient of access requests directed to the data storage device and wherein the host device and the network server are distinct devices:

receiving, from the host device, an access request originating from a second device, wherein the second device is distinct from the host device, the storage device, and the network server, and wherein the host device is accessible to the second device via the network server; and

when the second device is authorized to access the data storage device, sending a response with access information to the second device via the network server.

2. The method of claim **1**, wherein the network server, the host device, and the second device communicate via a network.

3. The method of claim **2**, wherein the network comprises a public network, a private network, or a combination of public and private networks.

4. The method of claim **1**, wherein the request includes a credential that enables determining whether the second device is authorized to access the data storage device.

5. The method of claim **4**, wherein the credential includes a username and password.

6. The method of claim **4**, wherein the credential corresponds to an account associated with a user of the data storage device.

7. The method of claim **1**, wherein the access request and the response are communicated via a secured communication session.

8. The method of claim **1**, wherein the second device is a mobile device.

9. The method of claim **1**, wherein the access request is a request to read a file in the memory and wherein the access information includes data read from the file.

10. The method of claim **1**, wherein the access request is a request to write a file in the memory and wherein the access information includes an acknowledgement that the file is written to the memory.

11. The method of claim **10**, wherein the file includes media content.

12. A data storage device comprising:

a memory;

a host interface; and

a controller coupled to the memory and to the host interface, the controller including a processor and configured to:

receive, from a host device, an access request originating from a second device, wherein the host device is accessible to the second device via a network server and wherein the host device is registered at the network server as a designated recipient of access requests directed to the data storage device, and wherein the host device, the second device, and the network server are each distinct devices; and

when the second device is authorized to access the data storage device, send a response with access information to the second device via the network server.

13. The data storage device of claim 12, wherein the controller is further configured to provide a host application to the host device.

14. The data storage device of claim 13, wherein the host application enables registration of the host device at the network server as the designated recipient of access requests directed to the data storage device.

15. The data storage device of claim 13, wherein the host application enables removal of the host device as the designated recipient of access requests directed to the data storage device when the data storage device is uncoupled from the host device.

16. A method comprising:

in a network server that is operatively coupled to a network, performing:

receiving an access request from a second device, wherein the second device is distinct from the network server, and wherein the access request is directed to a data storage device and wherein the access request includes a credential;

determining, based on the credential, that the second device is authorized to access the data storage device;

identifying a host device that is distinct from the second device and from the network server, the host device coupled to the data storage device and registered as a designated recipient of access requests directed to the data storage device; and

forwarding the access request to the host device to enable the second device to access the data storage device.

17. The method of claim 16, wherein the credential corresponds to a user account.

18. The method of claim 16, further comprising identifying a network address of the host device and forwarding the access request to the network address of the host device.

19. The method of claim 16, further comprising:

receiving, responsive to the access request, access information from the data storage device; and

forwarding the access information to the second device.

20. The method of claim 19, wherein the access information includes data retrieved from the data storage device during a read operation or an acknowledgment of a write operation at the data storage device.

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